Natural Radioactivity Measurements in Fine Aerosols

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ABSTRACT

Samples were collected at the MILAGRO T0 and T1 sites for measurements of ^{7}Be, ^{210}Pb, ^{210}Po, and ^{210}Bi on 8x10 inch quartz fiber filters at 12 hour increments (day - night) using high volume impactors with 0.1 to 1.0 micron size cuts. ^{7}Be and ^{210}Pb were determined directly by using gamma counting instrumentation. Portions of the samples were analyzed for ^{210}Po (138day half-life) and ^{210}Bi (5-day half-life) by using a solid phase extraction method developed at Argonne National Laboratory *(1)*. The samples were dissolved in nitric acid and then treated with HCL to form the metal chloride complexes. The ^{210}Po and ^{210}Bi can then be easily separated from the parent ^{210}Pb by filtering the solution through extraction membranes that have been impregnated with particles containing the strongly basic quarternary amine groups. The filter membranes were then counted to determine the adsorbed ^{210}Bi and ^{210}Po using beta and alpha counting equipment.

The samples will also be separated into organic and elemental carbon fractions and analyzed for ^{14}C, ^{13}C, and ^{12}C using accelerator mass spectrometry and isotope ratio mass spectrometry, respectively. These analysis are still underway and will be reported at a later date.

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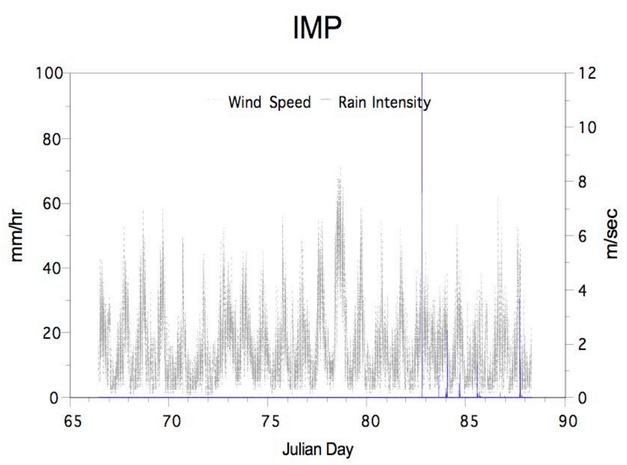
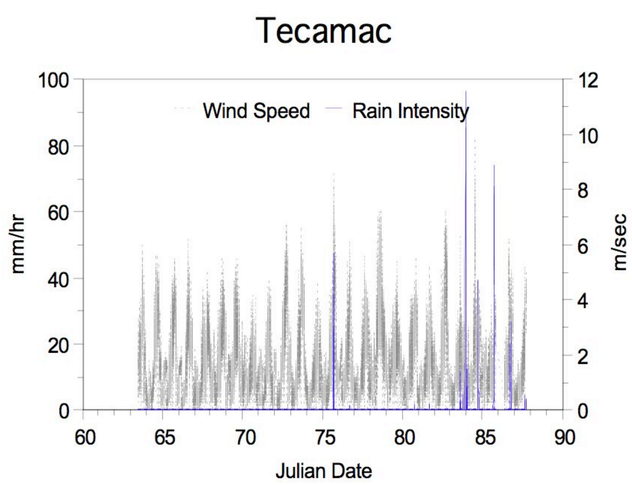
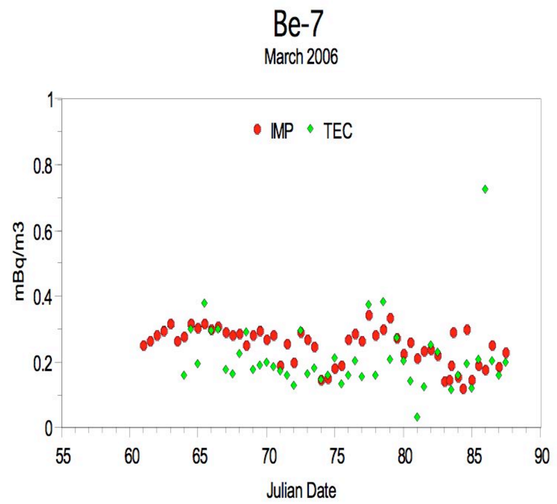
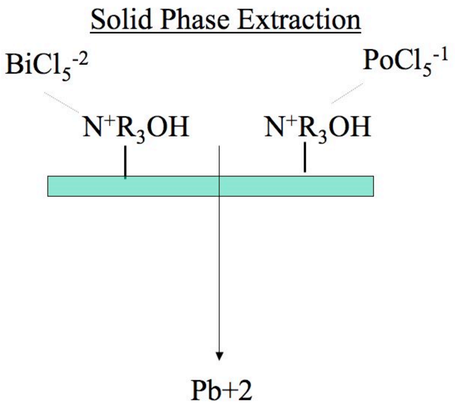
1. N.A. Marley, J.S. Gaffney, K.A. Orlandini, P.J. Drayton, and M.M. Cunningham "An improved method for the separation of ^{210}Bi and ^{210}Po from ^{210}Pb by using solid-phase extraction disk membranes: Environmental Applications" *Radiochimica Acta*, **85**, 71-78 (1999).

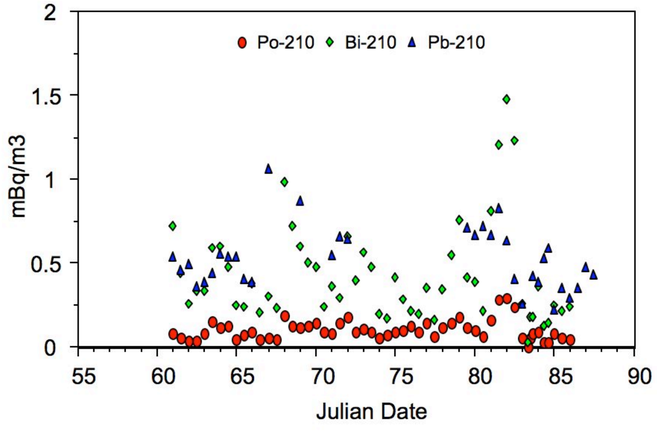


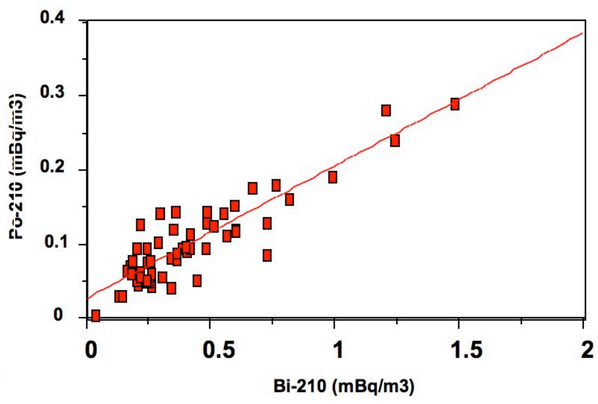




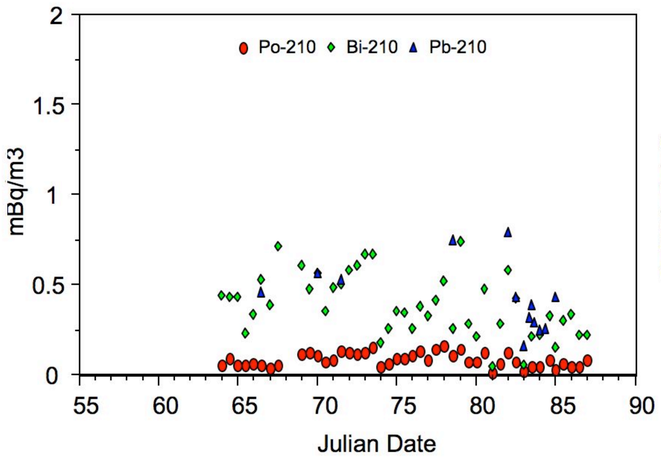


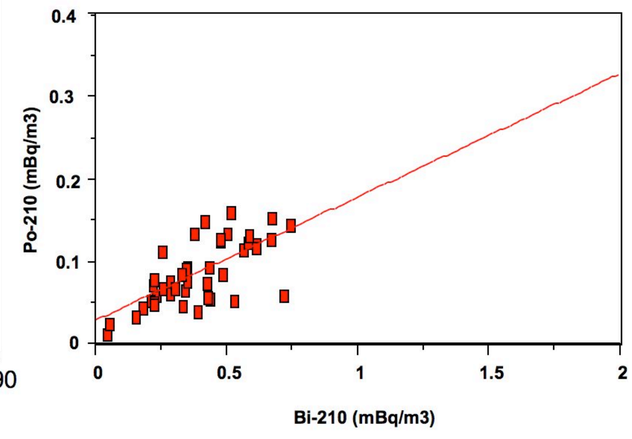
The parent Pb-210 can easily and quickly be separated from the progeny Bi-210 and Po-210 in their chloride forms.





R-square = 0.797 # pts = 54
y = 0.0271 + 0.178x





R-square = 0.452 # pts = 45
y = 0.0282 + 0.149x

Be-7 values were low during the study period indicating little upper atmospheric mixing. Bi-210 and Po-210 were similar at both sites and preliminary comparison of Po-210/Bi210 ratios indicate an average aerosol residence time of ~30 days at both sites.

Work on Pb-210, K-40, C-13, and C-14 is ongoing.These results will help determine the aerosol atmospheric residence times as well as % biogenic vs % fossil carbon in both organic and elemental aerosol fractions.

ACKNOWLEDGEMENT

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